HANDLING WORKING TELEPHONE CIRCUITS
SAFETY PRECAUTIONS
GENERAL METHODS

CONTENTS PAGE

1. GENERAL 1

2. RECOMMENDED WORK PROCEDURES FOR NORMAL VOLTAGE SYSTEMS 2

A. Avoid Creating Current Paths . . . 2

B. Where Insulated Tools Cannot Be Used 2

C. Ground 2

D. Summary 3

3. UNINTENTIONAL ELECTRICAL POTENTIALS ON TELEPHONE CIRCUITS 3

A. Lightning 3

B. Commercial AC Power Systems . . 3

C. KS-14103 L5 or L6 Breakdown Set . 4

4. CONSIDERATIONS FOR INDIVIDUAL CIRCUMSTANCES 4

1. GENERAL

1.01 This section covers safety precautions that are to be followed by craft persons while handling working telephone circuits.

1.02 When this section is reissued, the reason for reissue will be listed in this paragraph.

1.03 Experience has shown that craft persons may safely handle working telephone circuits using the basic precautions discussed in this section. Circuit voltages are no higher now than voltages used in the past.

1.04 By its nature, the telephone system must be reconfigured, tested, and maintained while the system is in operation. Accordingly, rearrangements and maintenance must often be done barehanded on continuously working circuits. Basic precautions while handling working telephone circuits are:

(a) Avoid creating current paths through the body.

(b) Minimize the area of contact.

1.05 The precautions described in Part 2 are consistent with working voltages which are used on the operating network.

Insulating gloves are used in certain work operations to avoid contact with hazardous voltages. The precautions described in Part 3 are not intended to supplant the use of insulating gloves in these work operations. The use of insulating gloves is not called for when working on telephone facilities which are carrying standard telephone voltages. Because of the limited nature of these voltages, the precautions of Part 2 are appropriate.

One step toward minimizing contact with excessive voltage is by testing potential hazards (eg, mobile homes, for power-down leads, newly driven ground rods, streetlight brackets, etc) with the 188A test set or B voltage tester. For detailed information on the use of these test sets, see Sec-

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tions 081-705-102 and 081-705-101, respectively. The 081 Division of the Bell System Practices also covers descriptions and uses of other voltage protection devices (insulating gloves, insulating blanket, etc).

2. RECOMMENDED WORK PROCEDURES FOR NORMAL VOLTAGE SYSTEMS

A. Avoid Creating Current Paths

2.01 There are two types of current paths: ***conductor to conductor*** and ***conductor to ground.***

2.02 ***Conductor to Conductor:*** Craft persons can avoid exposing themselves to the conductor-to-conductor voltage (which may be double the conductor-to-ground voltage) by ***contacting one conductor at a time.*** Accordingly, if possible, expose only one conductor at a time. Attach test clip leads first to one conductor of a line, then to the other—in short, a fundamental precaution is to avoid simultaneous contact with two conductors.

2.03 ***Conductor to Ground:*** If only one conductor is contacted, the only current path which could be established is from conductor to ground. This current path may be interrupted either by avoiding electrical contact with ground or grounded objects while working on the energized conductor or, if contact with ground is unavoidable, by using insulated tools to contact the energized conductor.

2.04 The use of insulated tools is highly recommended for interrupting the current path from conductor to ground. A few turns of electrical tape on the clip leads of a test set or dipping the handles of a tool into an insulating coating (such as commercially available PDS Air Dry Plastic Coating) can help control the area of energized metal in contact with the hand and therefore help maintain the body impedance.

Most "insulated" tools or taped or dipped tools will offer very effective protection from normal system voltages. This is despite minor voids, imperfections, or openings in the insulation since these provide only very small area contacts. However, these tools are not the equivalent of standard insulating gloves.

2.05 ***Insulated Tools:*** Examples of other standard insulated tools are:

- Insulated screwdrivers
- Insulated pliers
- 216 tool
- Wire cutters
- D impact tool
- 788-type insertion tool.

B. Where Insulated Tools Cannot Be Used

2.06 Where insulated tools cannot be used, the current path to ground may be minimized by:

- Keeping the area of contact small
- Keeping the area of contact dry.

2.07 ***Small Area:*** The area of contact is important. A large area (full-hand) contact may offer five to ten times less resistance than would a small area (finger) contact.

Danger: If the ground is wet, take special care to use insulated tools, wear rubber boots, or stand on a rubber mat or dry boards.

2.08 ***Dry Versus Wet Areas:*** Another factor which can diminish body resistance is ***moisture.*** Not only does moisture reduce resistance at the point of contact, a wet area tends to effectively enlarge the area of contact. In wet areas or rainy weather, rubber footwear may be necessary to prevent good contact to ground while handling working circuits.

C. Ground

2.09 Where practical, avoid contact with ground or grounded objects when bare-handed contact with working conductors is necessary. In most cases where contact with ground or grounded objects is difficult to avoid, the use of insulated tools is the preferred method of working. Typical grounded objects are:

- Bare ground

- Cable shield or sheath
- Strand
- Anchor guys
- Manhole floors, walls, hardware
- Trees, shrubs, vines
- Concrete floors, sidewalks, etc
- Building framework
- Electrical conduit
- Plumbing
- Large appliances or electric apparatus cases.

D. Summary

2.10 The following set of precautions are recommended for working safety while handling working telephone circuits.

(1) Whenever possible, work with one conductor at a time.

(2) Avoid creation of current paths through oneself by:

(a) Avoiding bare-handed contact with the working conductor by using insulated tools.

(b) If bare-handed, contact is necessary:

- Whenever possible, avoid contact with grounded objects.
- Make the smallest area direct contact possible to ground and conductor.
- Make ground and conductor contacts as dry as possible.

3. UNINTENTIONAL ELECTRICAL POTENTIALS ON TELEPHONE CIRCUITS

3.01 Some electrical potentials on telephone plant are unintentional, such as lightning and voltages from commercial ac power systems. Also, special procedures must be observed when using the 600 Vdc breakdown test set.

A. Lightning

3.02 Lightning strikes to or near aerial or belowground telephone plant can produce momentary hazardous voltages in a cable. During an electrical storm, work on exposed telephone plant should be avoided until lightning activity in the immediate area stops. Personnel should retreat to a telephone truck, auto, or move indoors while a lightning storm is in progress.

B. Commercial AC Power Systems

3.03 Commercial ac power systems may couple electrical energy into telephone facilities in the course of normal operations and also under fault conditions. Under normal conditions, the only significant coupling of the two systems is electromagnetic in origin. Two forms of coupling are commonly referred to as magnetic and electrostatic.

3.04 ***Magnetic Coupling:*** Significant magnetic coupling can occur under normal conditions when power lines and telephone lines run long distances together and imbalances exist on power lines. The precautions recommended in Part 2 should be sufficient in all but extreme cases. Induction voltages may vary by as much as a factor of two in a few hours and shift location as the load on the power system changes. Therefore, continue to observe normal precautions throughout work operations even though initial procedures indicated that the induction is low.

3.05 ***Electrostatic Coupling:*** Significant electrostatic coupling occurs only near large, high-voltage power lines and may produce painful electrical shock. Procedures for working in the vicinity of such structures involve maintaining a ground connection to all conductors during the installation and removal. In addition, poles carrying telephone facilities in these areas must be equipped with special grounded lines to prevent craft persons who are working aloft from becoming energized. Details of these procedures are contained in Section 620-100-015.

3.06 ***Power Faults:*** Power faults are typically of short duration (less than five seconds), but occasionally may last for longer periods if power company circuit breakers are not actuated. As with lightning, these fault-induced voltage levels are high enough so that the best protection is avoiding contact. Inspect for sagging or downed power lines which

may be contacting telephone plant, particularly following a heavy wind or ice storm. Remember, damage may not be evident or local. In situations where extensive storm damage occurs, insulating gloves should be used until supervision has determined the telephone plant is free from hazardous voltages.

C. KS-14103 L5 or L6 Breakdown Set

3.07 Where the KS-14103 L5 or L6 breakdown test set (600 Vdc) is being used, it must be handled with caution. Contact with energized lines must be avoided. For details, consult Section 634-305-502.

4. CONSIDERATIONS FOR INDIVIDUAL CIRCUMSTANCES

Danger: In wet conditions, donning rubber footwear or standing on rubber blankets or dry boards may be necessary to isolate the individual from ground and permit working barehanded on labeled system voltages.

4.01 The recommendations in Part 2 should be followed at all times. Craft persons must be especially certain to heed these measures if a yellow and black label with words such as "CAUTION, ELEVATED VOLTAGES, HANDLE WITH CARE" is present (Fig. 1). This label indicates a circuit in the upper range of the normal system voltages and serves as a reminder that these precautions are especially necessary.

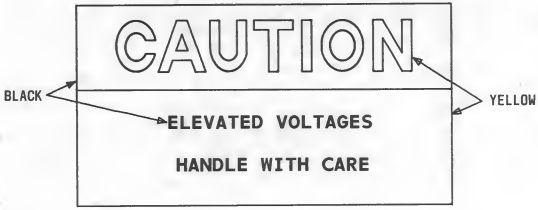

Fig. 1—Typical Upper Voltage Label

4.02 ***Working Outdoors at Ground Level or in Wet Indoor Locations:*** Low resistance contact with ground is difficult to avoid in these circumstances if footwear becomes wet. With barehanded contact (particularly with labeled voltages), the use of rubber footwear or standing on mats or dry boards to isolate the individual from ground may be required.

4.03 ***Working Outdoors Aloft:*** Contact with ground is most likely to occur from cable shield, down guys, and support strand. Simultaneous contact with these grounded objects should be avoided while working on telephone circuits. In situations where significant contact with grounded objects cannot be avoided and labeled telephone circuits are involved, insulated tools are recommended.

Danger: Care should be exercised to avoid contact with grounded objects when bare-handed contact is necessary with labeled circuits.

4.04 ***Working in Dry Indoor Locations or Central Offices:*** Most dry footwear will effectively insulate from grounded flooring. Contacts

(eg, from resting or leaning against large appliances or metal equipment cases) with grounded surfaces present the most likely means of completing a circuit path while working in bare-handed contact with working telephone circuits. Central office workers are cautioned that central office equipment frames are grounded.